



QUESTION WORKBOOK

Surface area to volume ratio: why size limits diffusion

Exchange surfaces and gas exchange · Unit B07

AQA 3.3.1 · OCR A 3.1.1 · CAIE 8.1, 9.1

5 questions · 16 marks

PRINT EDITION

SECTION A · Short, 1 to 2 marks

- A1** State the relationship known as Fick's law, naming all three of the quantities on which the rate of diffusion across a surface depends. [2]

SECTION B · Standard, 3 to 5 marks

- B1** A cube-shaped organism has sides of 0.5 mm. A second organism of the same shape has sides of 2.0 mm. Calculate the surface area to volume ratio of each, giving a unit, and calculate how many times greater the smaller organism's ratio is. [4]

- B2** A flatworm 0.3 mm thick supplies all of its cells with oxygen by diffusion across its body surface. A block of tissue one centimetre thick cannot. Explain the difference. [4]

- B3** A sphere and a flattened sheet contain identical volumes of tissue. The sphere has a surface area to volume ratio of 2.4 and the sheet one of 8.8. Compare the two shapes as exchange surfaces. [3]

- B4** A hibernating dormouse curls its body into a tight ball. Suggest how this reduces the rate at which it loses heat to its surroundings. [3]
